IOWA energy BULLETIN

Department of Natural Resources
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# Got Methane?

## Top Deck Dairy in Westgate, Iowa Generates Electricity from Manure

**A methane digester (equipment in forefront) captures energy that fuels two generators (housed in building in background).**

Iowa's first cow-manure methane recovery system is turning waste into electricity in northeast Iowa. Add the benefits of odor and air emission reductions into the mix, and this dairy farm is operating a promising technology for Iowa's future.

Top Deck Dairy, Inc., Westgate, is owned by Judy and Roger Decker along with their sons, Derek, Jason and Justin. The family has installed a system that captures methane from decomposing manure to power two generators.

The electricity produced is being sold to Alliant Energy.

### The Construction Process

When the Decker family decided to expand its dairy operation from 300 to 700 cows, they researched the potential of installing an anaerobic digester for electricity production.

The Department of Natural Resources and the Natural Resources Conservation Service (NRCS) provided a $157,900 grant to build the digester, while Alliant Energy supplied $200,000 for the generators and to connect the system to the utility grid. Top Deck Dairy funded the remaining costs of the $450,000 facility.

Construction of the system began in the fall of 2000. Dan Meyer, Iowa State University Extension engineer, coordinated construction of the project, and electricity production began in May 2002. To date, the system has operated successfully, with no major mechanical problems.

### The Science

Methane is the main component of natural gas. It is also a component of biogas, which is generated during

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## In This Issue.....

# Message from Sharon Tahtinen

## *DNR Extends Hand to Biofuels Industry*

During the past two years, the biofuels industry – including ethanol and biodiesel producers – has experienced tremendous growth in Iowa. As an example, more than 11 new ethanol plants have been planned here, or have begun producing ethanol, since 2001.

The DNR strongly supports the development and expansion of the biofuels industry in our state. As with all industries, including those developing renewable energy, we want to help Iowa businesses do what is best for natural resources without sacrificing economic success.

Because of this, we are making environmental compliance with this growing industry a top priority. Our goal is to provide compliance assistance, education, and to serve as a resource in the early stages of plant planning.

As a first step of this process, the DNR hosted a stakeholder meeting in October 2002 to bring together industry representatives with DNR air quality, water quality and energy experts. We believe these and continuing efforts in the future will help improve communication and partnerships.

Our agency is working to expand and improve service to customers and the people of Iowa. Working with the biofuels industry is one example of where, together, we can do an excellent job for the economy and the environment.

Sincerely,

Sharon A. Tahtinen

Sharon A. Tahtinen
Public Service Executive

# Iowa School Buses Earn Free Emissions Tests

Every diesel-engine school bus in Iowa will get a free test of its air emissions, thanks to a collaborative program launched this year called BEEP - the Bus Emissions Education Program. The initiative is being organized and promoted through a collaborative effort of the Iowa DNR, the Iowa Dept. of Education, the School Administrators of Iowa, the Iowa Pupil Transportation Association, and Mirenco, Inc.

Over a five-year period, Mirenco, an Iowa-based emissions control company out of Radcliffe, will test every school bus in the state twice a year. The tests are performed at the same time the state conducts routine bus inspections. The first round of tests occurred in July 2002, when every one of Iowa's 4,500 school buses received a free emissions test. The tests are paid for through private donations.

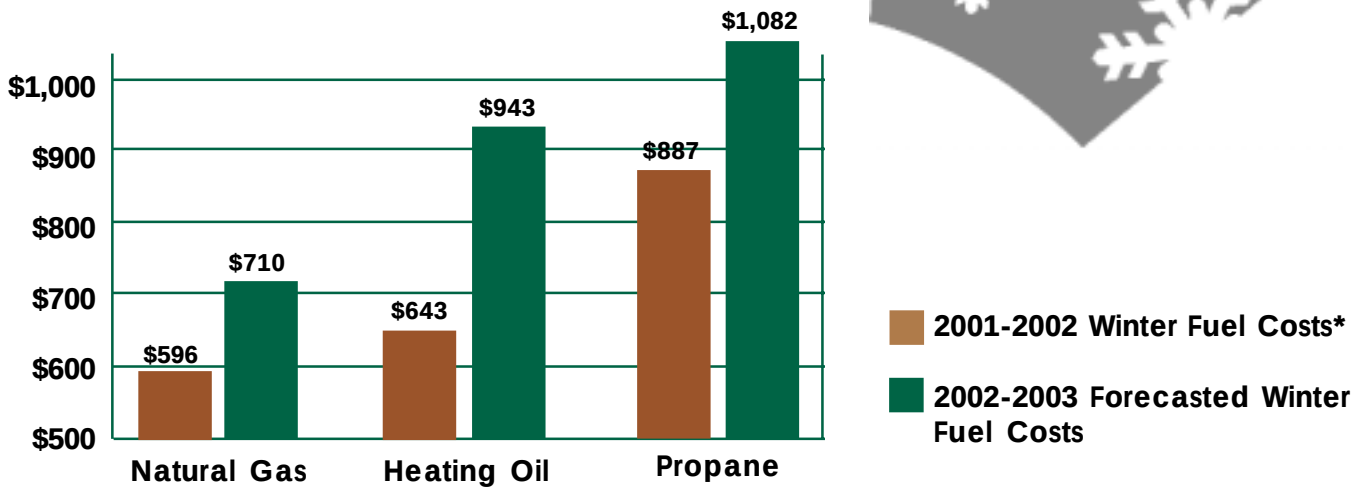
Through BEEP, Iowa school bus fleets will be able to identify specific buses needing maintenance to decrease air fumes, which can be potentially harmful to human health. The educational aspect of the program will help students gain greater understanding of environmental impacts on the road.

Officials say the program is the first voluntary school bus emissions testing program in the nation.

For more information, go to the Web site: **www.beeponline.org**

Analyst's Angle:

# Iowa 2002-2003 Winter Fuel Price Forecast




As Iowans prepare for the upcoming winter, they should also plan for noticeable increases in their utility bills.

Iowa household heating fuel expenditures are projected to rise 19 to 45 percent from October through March, depending on the type of heating fuel used. The rise is partly due to an increase from last year's lower-than-average prices. Additionally, forecasters are predicting greater demand because of cold weather, along with generally higher fuel prices.

## National Impacts

From a national standpoint, most heating fuel inventories have been above normal levels, but are now beginning to decline. This has led to a rise in prices. Additionally, the price of crude oil is projected to rise 58 percent above last year. Heating oil and propane, two significant fuels used for heating fuel in Iowa, are refined from petroleum.

Rising heating fuel costs also are supported by a 10-percent reduction in U.S. natural gas refining capacity. Lower drilling and exploration activity, increased demand from electric generation facilities and rising demand in the industrial sector are all pinching natural gas supplies.

## Natural Gas Outlook

Iowa households relying on natural gas may pay up to $114 more this winter, a 19 percent increase. Natural gas prices have been trending higher as natural gas storage levels decline. Early weather-related demand and increased use from an improving industrial sector have outpaced new supply. About 65 percent of Iowans use natural gas for heating.

## Propane Gas Outlook

The 14 percent of Iowans using propane for home heating will face a 22 percent rise in fuel costs, as much as $195 during the heating season. Propane prices are expected to begin their seasonal climb as weather-related demand increases in early November and crop drying returns to normal levels. Propane prices are being pushed higher by growing demand from the petrochemical industry, the largest consumer of propane. Propane demand in the Midwest region is projected to be 12 percent higher this heating season.

## Heating Oil Outlook

Heating oil prices are expected to jump 45 percent this year. The 5 percent of Iowa households using heating oil could pay up to $290 more this season because of the price hike. Heating oil prices are trending higher because of rising crude oil prices and reduced refinery production.

For more information about state and national fuel costs, contact David Downing with the DNR at (515) 281-4876; e-mail: **David.Downing@dnr.state.ia.us**, or Jennifer Moehlmann at (515) 281-8518; e-mail: **Jennifer.Moehlmann@dnr.state.ia.us**

***For average household sizes**

# Got Methane?

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**Each year, Iowa's livestock confinement operations produce 81 million tons of manure.**

**This amount of manure has the potential to generate 2.8 billion kWh of electricity each year.**

**That is equivalent to the energy consumed by 325,000 homes annually.**

the decay of organic (living or once-living) materials in an anaerobic, or oxygen-free, environment. Oxygen-free conditions occur in natural systems such as wetlands and bogs, and in artificial systems like landfills, lagoons and specially designed tanks called anaerobic digesters. The methane produced can be burned to generate heat or electricity.

## The Technology

The Deckers installed a system called a plug-flow digester that treats the manure. About 17,000 gallons of manure produced daily is scraped to the digester, where it decomposes and subsequently produces methane gas.

The captured methane gas is sent through a connecting pipe to a 150-horsepower engine with a 100kW generator and a 30kW microturbine. The generators create 864,000 kWh of electricity annually, enough to meet the energy needs of 100 homes. That electricity is sold to Alliant Energy for about $.02 per kWh.

Heat from the engine and microturbine are captured to preheat the manure, improving the anaerobic process. Hot water from a heat exchanger provides floor heat to the parlor area, where the cows are milked.

## The Benefits

Interest is growing in methane recovery at livestock operations because of the environmental and economic benefits that can be generated. Capturing methane can control odor and decrease the potential for pollution. While systems are currently expensive, their societal and environmental benefits may outweigh those costs.

Just as importantly, methane recovery develops a renewable resource, offsets fossil fuel consumption, and reduces environmental pollutants.

Economically, offsetting energy use through on-site power production reduces energy bills. Through an agreement with Alliant Energy, Top Deck is the first dairy in Iowa to put power on the electrical grid, and is one of 20 operating in the country today.

**Once methane has been captured for electricity production, the remaining effluent is pumped to this storage basin for later use as a fertilizer.**

**About 17,000 gallons of manure produced dail cows at the Top Deck Dairy operation is scrap system for me**

## The Potential

Top Deck Dairy is demonstrating the effectiveness of methane recovery technology, especially at larger livestock facilities. Each year, Iowa's livestock confinement operations – including cattle, hogs and chickens — produce 81 million tons of manure. This amount has the potential to generate 2.8 billion kWh of electricity each year, equivalent to the energy consumed by 325,000 homes annually.

## To Learn More on Methane Energy Recovery

For more information on methane recovery in Iowa, contact David Downing with the DNR at (515) 281-4876; e-mail: David.Downing@dnr.state.ia.us

Here is a list of additional Web site resources across the nation on methane energy recovery:

**Iowa DNR Renewable Programs**
www.state.ia.us/dnr/energy

**Methane Information from EPA**
www.epa.gov/agstar
-or-
www.epa.gov/methane

**Consumer Methane Information from DOE**
www.eren.doe.gov/consumerinfo/refbriefs/ab5.html

**Methane Projects in Minnesota**
www.mnproject.org

**Purdue University Methane Research**
www.agcom.purdue.edu/AgCom/pubs/AE/AE-105.html

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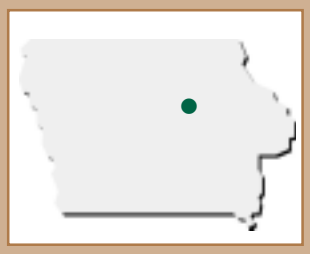
# Facts & Figures

## Top Deck Dairy Westgate, IA



**Owners:**
- Judy and Roger Decker along with their sons, Derek, Jason and Justin Decker

**Facility Description:**
- 300-cow free stall barn and parlor built in 1997
- 350-cow barn and connecting alley completed in May 2001
- 180 feet x 240 feet earthen manure lagoon holds 2 million gallons of manure

**Digester System:**
- Plug-flow digester tank is 27 feet x 124 feet x 12 feet deep; two additional 13 feet x 13 feet tanks preheat manure
- 17,000 gallons of manure produced daily at the facility are used for methane production

**Electricity Production:**
- 150 horsepower 6 cylinder engine powers a 100 KW generator
- 30 KW microturbine generator
- 864,000 kWh of electricity are produced annually, enough to meet the energy needs of 100 homes

**Project Investment:**
- Total cost of construction for system: $450,000
- $157,000 in funding came from Iowa DNR and NRCS
- $200,000 came from Alliant Energy

**Energy cost savings in avoided electricity use:**
- $40,600 through avoided electricity and heat costs, along with income from selling excess electricity generation

**Environmental Benefits:**
The electricity produced at this facility from a renewable resource annually avoids:
- 432 tons of coal
- 1,080 tons of carbon dioxide

**Project Partners:**
- Dan Meyer, project manager, ISU Extension
- Iowa Department of Natural Resources
- Alliant Energy
- Natural Resources Conservation Service (NRCS)

## Cargill Partners with Iowa Developers to Sell BioTrans

**Cargill Industrial Oils and Lubricants has purchased the patent to a bio-based oil called BioTrans used on electricial utility transformer lines. The oil was developed by Glenn Cannon, Waverly Light & Power, and Lou Honary with the Agriculture-Based Industrial Lubricants (ABIL) program at the University of Northern Iowa.**

**Cargill is partnering with Electric Research and Manufacturing (ERMCO) and Waverly Light & Power to market the product. ERMCO will offer BioTrans in its electrical transformers and has the exclusive rights to market the product in the United States, Canada and Mexico.**

**BioTrans is derived from soybean oil and replaces petroleum-based greases. ABIL is a research program developing and commercializing environmentally friendly industrial lubricants. Many state and national companies are using soy-based oils and greases developed by ABIL in their machinery and equipment.**

**For more information, contact ABIL at (319) 352-5218. Or go to the Web site: www.uni.edu/abil**

# A Leader in the New BioEconomy

## Iowa State University's CIRAS

**Definition of a BioEconomy: An economic infrastructure that relies on bio-based, renewable materials to develop products, fuels, energy and materials.**

The Center for Industrial Research and Services (CIRAS) at Iowa State University is becoming a driving force in the nation's move toward a BioEconomy. In its latest endeavor, the center is receiving $900,000 per year to develop a national certification program for bio-based products, complementing its menu of programs helping Iowa's agricultural industry.

Bio-based products are made from renewable materials grown in farm fields, coastal waters and managed forests. These resources can replace petroleum-based materials used in industrial and commercial products. Examples include lubricants, plastics made from soybeans, and building products made from cornstalks. It also includes renewable energy resources.

"The 21st century will see many petroleum-derived products replaced with less expensive, better performing bio-based products," said Wolfgang Kliemann, associate vice provost for research, in a recent news release. "Developing a bio-based industry in Iowa can give a significant boost to our state's economy and, at the same time, contribute to national security and environmental quality in the United States."

CIRAS assists Iowa manufacturers in identifying industrial problems and helping develop solutions. Through a cooperative agreement with the U.S. Department of Agriculture, CIRAS will use the grant money to set up systems for testing and certifying bio-based products according to specified protocols for bio-based content, life cycle costs and environmental effects. Funding for the program was authorized by the Farm Security and Rural Investment Act (the farm bill), which establishes a program in federal agencies for preferred procurement of bio-based products.

Another major program being implemented by CIRAS is the Industries of the Future – Agriculture program.With funding from the U.S. Dept. of Energy, and assistance from the Iowa DNR, Iowa Energy Center, ISU Extension and other partners, CIRAS has developed a vision and roadmap for bio-based products and bio-energy in Iowa. The goal of the program is to leverage Iowa's current agricultural base and establish new markets and opportunities for bio-based products developed in the state.

CIRAS will continue to be a leader for Iowa and the nation in an emerging BioEconomy.

For information, contact Ronald Cox with CIRAS at (515) 294-3420, or go to: **www.ciras.iastate.edu**

# DNR's Tahtinen Heads National Energy & Agriculture Committee

Sharon Tahtinen, energy official with the Iowa DNR, has been tapped to lead the Agriculture and Rural Development Task Force for the National Association of State Energy Offices (NASEO).

In her new role, Tahtinen will help direct NASEO's efforts to develop programs and exchange information on such agriculture-related issues as bio-energy, efficiency of agriculture operations, and renewable energy applications in farm facilities. The task force also provides guidance to federal agencies on energy-related agriculture challenges and opportunities to reduce energy use and develop renewable resources. One of the task force's major goals will be to provide input on implementation of the federal farm bill.

NASEO is a non-profit association of state and territory energy offices, along with affiliates from the public and private sectors. Thre group was created by the National Governors' Association to improve state energy programs and to work effectively with the federal government.

Tahtinen joined the 20-member board of directors for NASEO in 2002.

For more information, contact Tahtinen at (515) 281-7066; e-mail: Sharon.Tahtinen@dnr.state.ia.us

# Photovoltaic Guide for Building Owners

The Iowa Department of Natural Resources has created a guide to help building owners interested in installing photovoltaic (PV) systems.

Designed for both residential and commercial applications in the Midwest, the guide offers a complete checklist of questions to consider when installing PV, such as where the system should be located, how much does it cost, when does PV make economic sense, and more. It also includes a list of resources, incentives and programs for Iowa, Illinois, Minnesota, Missouri, Nebraska and Wisconsin.

For a copy of the guide, go to: **www.state.ia.us/dnr/energy/programs/solar**

# California Enacts Renewable Energy Standard

California Gov. Gray Davis has signed a bill establishing a Renewable Portfolio Standard (RPS) for the state. The RPS will nearly double California's existing wind, geothermal, biomass and solar resources.

The bill, which was signed Sept. 12, 2002, requires retail sellers of electricity to increase their use of non-hydro renewable resources by at least 1 percent per year until 20 percent of their retail sales are procured from renewable sources. Retailers are required to reach the 20 percent mark by 2017.

Davis also signed a bill committing California to continue public programs that support renewable energy and renewable energy research. It also allows for net metering for specific California facilities and ensures available funds for the RPS.

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# Calendar of Events

**February 17-19, 2003.** Scottsdale, AZ. *8th Annual National Ethanol Policy and Marketing Conference*. For details go to: www.ethanolrfa.org/nec.shtml

**February 19, 2003.** Ankeny, IA. *Energy Analyst's Workshop*. For state-licensed engineers and architects interested in qualifying to complete technical engineering analyses for DNR building energy management programs. The one-day workshop will take place at the Energy Resource Station at the Des Moines Area Community College Campus. Contact Chad Stobbe with the DNR at (515) 242-5851 or Chad.Stobbe@dnr.state.ia.us

# Web Browser

**Iowa Department of Natural Resources**
**www.state.ia.us/dnr/energy**

**Iowa Energy Center**
**www.energy.iastate.edu**

**Leopold Center for Sustainable Agriculture**
**www.leopold.iastate.edu**

**Center for Global and Regional Environmental Research**
**www.cgrer.uiowa.edu**

**University of Northern Iowa's Ag-Based Industrial Lubricants**
**www.uni.edu/abil**

**Iowa State University's Office of BioRenewables Programs**
**www.csetweb.me.iastate.edu/biooffice.htm**

**Center for Industrial Research and Services**
**www.ciras.iastate.edu**

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